Abstract

Background: Hirsutism is defined as excessive terminal hairs that appear in women in a male-like pattern (i.e., sexual hair). It is relatively a common and important medical problem affecting about 5-10% of women in reproductive age. The growth of sexual hair is entirely under the influence of androgens, many hormones have androgenic potential in the human body, but testosterone is the key circulating androgen which is produced by the ovaries and adrenals. Hirsutism can be familial, idiopathic, or caused by excess androgen secretion by the ovary, adrenal glands or exogenous pharmacologic sources of androgen and other miscellaneous endocrine abnormalities.

Aim of the study: To shed light on hirsutism as a rising problem among women in our society, evaluating those hirsute women both clinically and biochemically.

Results: Fifty women with hirsutism were included in this study, their ages ranged from 14-45 years with a mean of 27.64 ± 7.267 years. Mean duration of disease was 7.52 ± 6.217 years; while mean age of onset 20.36 ± 4.758 years. All patients had slow progression of hirsutism over years. Positive family history was found in 80% of patients, 38% were married, 6 (12%) are infertile. Irregular menstrual cycles were found in 44%, mostly in a form of oligomenorrhea. The number of hirsute patients who were over weight or obese (BMI ≥25) was 30 patients (60%), [16 patients had android obesity (WHR≥0.85) and 14 patients had overall (non android) obesity], while the number of non obese hirsute patients (BMI<25) was 20 patients (40%), 31 patients (62%) had elevated serum total testosterone, there was highly significant statistical difference regarding serum testosterone when compared with control group (p-value 0.0001). 20% of patients had elevated serum prolactin, while 4 patients (8%) of control group had elevated serum prolactin.

Conclusion: Hirsutism is not merely aesthetic problem, it can be linked to several metabolic and endocrine abnormalities especially if a patient presents with moderate-severe hirsutism even when it had a slow progression or family history can be obtained.
Introduction

Definition:

Hirsutism is defined as excessive terminal hairs that appear in women in a male-like pattern (i.e., sexual hair).

Hypertrichosis on the other hand, is excessive terminal hair growth in a non sexual pattern. [1]

Prevalence:

It is relatively a common and important medical problem affecting about 5-10% of women in reproductive age, [1, 2] The prevalence of hirsutism is dependent on the ethnic and racial origin of the population under study, but it also depends to a certain degree on the method used to diagnose hirsutism. An incidence of hirsutism of 8% was found in the US [3], while in Iraq a study was done in 1992 showed that the incidence among Iraqi women was 59% [4]. Fair skinned Europeans have the least amount of terminal hair, whereas southern European dark skinned Mediterranean women have the greatest amount of terminal hair [2].

Pathogenesis: The growth of sexual hair is entirely under the influence of androgens. Vellus hair is present before puberty. By the effect of increased level of androgens at puberty, vellus follicles develop into terminal hair at androgen sensitive areas. Hirsutism can results from an increased androgen level or over sensitivity of the hair follicles to androgen. However, the severity of hirsutism does not correlate well with the level of androgen because the response of hair follicles to androgen excess varies considerably within and among persons [5].

Many hormones have androgenic potential in the human body, but testosterone is the key circulating androgen which is produced by the ovaries and adrenals either as testosterone or as prohormones (mainly androstenedione and dehydroepiandrosteron sulfate) which are metabolized into testosterone in the
peripheral tissues such as fat [6]. Testosterone is converted into dihydrotestosterone (DHT) in the peripheral tissue by the enzyme 5-α reductase. DHT is the most potent androgen in the body. The phenomena of increased conversion rate of DHT in the target area may help to clarify the increased sensitivity of hair follicles to androgens [2].

Virilization is the combination of hirsutism plus other signs of masculinization; like: acne, increase sebum production, deepening of the voice, fronto-temporal balding, infrequent or absent menses and clitoral hypertrophy. It is associated with marked increased androgen production by the ovaries or adrenals or both [1, 2, 7]. Other abnormalities associated with androgen augmentation include: dyslipidemia, diabetes, hypertension, insulin resistance, android obesity, coronary heart disease and endometrial carcinoma [8, 9, 10].

**Causes:** Increased androgen effect that results in hirsutism can be familial, idiopathic, or caused by excess androgen secretion by the ovaries or adrenals or both [1, 2, 7]. Other abnormalities associated with androgen augmentation include: dyslipidemia, diabetes, hypertension, insulin resistance, android obesity, coronary heart disease and endometrial carcinoma [8, 9, 10].

**Evaluation:** Clinical evaluation of a woman with hirsutism include thorough history and physical examination seeking for a possible cause and also using standardized scoring system for the amount and degree of hirsutism. The most common method of scoring body and facial terminal hair growth used today is the modified Ferriman-Gallway score. This grades the hair growth between 0 (absence of terminal hair) to 4 (extensive terminal hair growth) at nine different body sites (upper lip, chin, chest, upper & lower abdomen, upper & lower back, arm and inner thigh). Hirsutism is said to be present if the total score is 8 or more [1, 2, 15].

**Aim of the Study**
To shed alight on hirsutism as a rising problem among women in our society, evaluating those hirsute women both clinically and biochemically.

**Patients and Methods**
This study was conducted in Hilla city during a period of one year from September 2010 to September 2011. A group of 50 patients in whom the chief complain was hirsutism and were attending to private clinic for IPL hair removal. Another group of 20 healthy non hirsute age-matched women was
also included in the study as a control group. All 50 patients were evaluated initially regarding the presence and severity of hirsutism by using modified Ferriman-Gallway score (a visual scoring system) by a single examiner to avoid bias. (Figure 1).

**Figure 1** Modified FG scoring system: Clinically, terminal hair hairs can be distinguished from vellus hairs primarily by their length (i.e. greater than 0.5 cm) and the fact that they are usually pigmented.

History regarding the following items was taken from each patient: duration and onset of the disease, rate of progression, family history, menstrual history, marital status, frequency and method of epilation used, drug history (specially androgenic and hormonal therapies).

Physical examination was done for each patient and this include the following anthropometric measures: height (measured without shoes against wall-fixed tape), weight (measured with light cloths and without shoes), waist circumference (with a tape measure 2 cm above the umbilicus), hip circumference was also measured then waist/hip ratio (WHR) was calculated. BMI was calculated as: weight/(height in meter)$^2$. BMI $\geq$ 25 indicate over weight or overall obesity, while WHR $\geq$ 0.85 indicate android obesity.

Physical examination also looking for dermatological features of hyperandrogenism like: seborrhea, acne, androgenic alopecia and for acanthosis nigricans. Patients examined for the presence of hypertrichosis.

Any patient take antiandrogenic or hormonal therapy 3 months before participation was excluded from this study.

Fasting blood samples were taken from all patients and control group for hormonal analysis (total testosterone and prolactin hormones). Serum total testosterone level assessed by using ELISA technique, while serum prolactin was assessed by Minividas device.
Statistical analysis was done by using SPSS package1998.

**Results**
Fifty women with hirsutism were included in this study, their ages ranged from 14-45 years with a mean±SD of 27.64 ± 7.266. Duration of the disease was ranged from 1-28 years (mean duration 7.52 ± 6.217); while age of onset of the disease was ranged 12-32 years (mean age of onset 20.36 ± 4.758). (Table 1)

**Table 1** Age, duration and age of onset of hirsute women.

<table>
<thead>
<tr>
<th></th>
<th>Range (years)</th>
<th>Mean ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age of patients</td>
<td>14-45</td>
<td>27.64 ± 7.266</td>
</tr>
<tr>
<td>age of onset</td>
<td>12-32</td>
<td>20.36 ± 4.758</td>
</tr>
<tr>
<td>Duration of the disease</td>
<td>1-28</td>
<td>7.52 ± 6.217</td>
</tr>
</tbody>
</table>

Rate of progression of the disease was slow for all patients 100% (over years). Positive family history was found in 40 patients (80%) (whether 1st or 2nd degree relatives) with 58% had positive family history in more than two members of the family. 19 patients (38%) were married, of them 6 (12%) are infertile. Irregular menstrual cycles were found in 22 patients (44%), mostly in a form of periods of oligomenorrhea.

Body weight of patients group ranged 40-125 kg with a mean of 68.4±7.266, BMI was ranged 18.26-50.07 with a mean of 27.84±6.579, there was no statistical significant difference with the mean body weight & BMI of the control group (P-value>0.05). (Table 2)

**Table 2** Mean weight and BMI of patients group compared with control group.

<table>
<thead>
<tr>
<th></th>
<th>Patients group n=50</th>
<th>Control group n=20</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean wt./kg</td>
<td>68.4±7.266</td>
<td>62.9±4.854</td>
<td>0.077 not significant</td>
</tr>
<tr>
<td>Mean BMI</td>
<td>27.84±6.579</td>
<td>25.30±2.158</td>
<td>0.074 not significant</td>
</tr>
</tbody>
</table>

The number of hirsute patients who are over weight or obese (BMI ≥25) is 30 patients (60%), [16 patients had android obesity (WHR≥0.85) and 14 patients had overall (non android) obesity], while the number of non obese hirsute patients (BMI<25) was 20 patients (40%). Figure (2)
The mean body wt. and BMI of patients with android obesity are increased over that of patients with non-android obesity, but statistical significant difference found only between mean body wt. of the two groups (P-value 0.047). (Table 3)

**Table 3** Mean body weight and BMI of non-obese, android and non-android obesity patients groups.

<table>
<thead>
<tr>
<th></th>
<th>Non-obese (n=20) (BMI&lt;25)</th>
<th>Obese (n=30) (BMI≥25)</th>
<th>android obesity (n=16) (WHR≥0.85)</th>
<th>Overall obesity (n=14) (WHR&lt;0.85)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean wt./kg</td>
<td>54.8±5.827</td>
<td>81.875±18.278</td>
<td>72.428±9.685</td>
<td></td>
</tr>
<tr>
<td>Mean BMI</td>
<td>22.1±1.568</td>
<td>32.4±6.259</td>
<td>29.2±4.377</td>
<td></td>
</tr>
</tbody>
</table>

The level of serum total testosterone of patients group was ranged 0.17± 6.15 ng/ml with a mean of 1.73±1.496, 31 patients (62%) had elevated serum total testosterone (testosterone> 0.9ng/ml), mean level in those patients was 2.5±1.41, while the level of serum total testosterone of control group was ranged 0.01± 1.67 ng/ml with a mean of 0.4±0.443, 2 patients only (4%) had elevated serum total testosterone, mean level was 1.43±0.33. There was highly significant statistical difference between the two groups (P-value 0.0001). (Table 4)
Table 4 Mean of serum total testosterone level in patients and control groups.

<table>
<thead>
<tr>
<th></th>
<th>Range of testosterone (ng/ml)</th>
<th>Mean±SD</th>
<th>Number of patients with↑ testosterone.</th>
<th>Mean±SD</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients group</td>
<td>0.17- 6.1</td>
<td>1.73±1.496</td>
<td>31 (62%)</td>
<td>2.50±1.41</td>
<td>0.0001</td>
</tr>
<tr>
<td>Control group</td>
<td>0.01- 1.67</td>
<td>0.4±0.443</td>
<td>2 (4%)</td>
<td>1.43±0.33</td>
<td></td>
</tr>
</tbody>
</table>

The level of serum prolactin of patients group was ranged 0.5± 54.2 ng/ml with a mean of 17.84±9.915, 10 patients (20%) had elevated serum prolactin (level>23 ng/ml), mean level in those patients was 32.11±9.839, while the level of serum of prolactin in control group was ranged 3.29± 79.74 ng/ml with a mean of 23.43±22.351, 4 patients (8%) had elevated serum prolactin, mean level was 61.25±25.386. there was no significant statistical difference between the two groups (P-value 0.074). *(Table 5)*

Table 5 Mean of serum prolactin level in patients and control groups.

<table>
<thead>
<tr>
<th></th>
<th>Range of prolactin (ng/ml)</th>
<th>Mean±SD</th>
<th>Number of patients with↑ prolactin</th>
<th>Mean±SD</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients group</td>
<td>0.5-54.2</td>
<td>17.84±9.915</td>
<td>10 (20%)</td>
<td>32.11±9.839</td>
<td>0.074</td>
</tr>
<tr>
<td>Control group</td>
<td>3.29-79.74</td>
<td>23.43±22.351</td>
<td>4 (8%)</td>
<td>61.25±25.386</td>
<td></td>
</tr>
</tbody>
</table>

Regarding patients group only, there was no significant statistical correlation between serum total testosterone and serum prolactin hormones with BMI and WHR (P-value >0.05). *(Table 6)*

Table 6 Mean testosterone and prolactin hormones according to BMI and WHR.

<table>
<thead>
<tr>
<th></th>
<th>BMI&lt;25 (Non-obese)</th>
<th>BMI≥25 (obese)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>WHR&lt;0.85 (non-android obesity)</td>
<td>WHR≥0.85 (android obesity)</td>
</tr>
<tr>
<td>Mean testosterone</td>
<td>1.71±1.354</td>
<td>1.91±2.022</td>
</tr>
<tr>
<td>Mean prolactin</td>
<td>18.424±9.826</td>
<td>29.204±11.419</td>
</tr>
</tbody>
</table>

The score of hirsutism for all 50 patients was ranged from 8-21 with a mean of 13.12±3.777. Patients were divided into two groups regarding their score of hirsutism: *(Figure 3)* those with mild hirsutism (score 8-15): they were 36 patients (72%) those with moderate to severe hirsutism (score > 15): they were 14 (28%).
There was significant correlation between score of hirsutism and BMI of the patient (correlation coefficient 0.023), also there was significant relationship between score of hirsutism and WHR, as patients with android obesity had a higher scores than patients with overall non-android obesity (p-value=0.004). (Table 7)

**Table 7** Mean score of hirsutism in patients with android and non-android obesity.

<table>
<thead>
<tr>
<th>Patients group</th>
<th>Mean score ±SD</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Android obesity (n=16)</td>
<td>13.1±6.067</td>
<td>0.004</td>
</tr>
<tr>
<td>Non-android obesity (n=14)</td>
<td>11.14±3.393</td>
<td></td>
</tr>
</tbody>
</table>

Regarding patients with mild hirsutism (n=36): mean of serum total testosterone was 1.284 ±1.994, 21 patients (58.3%) had elevated testosterone with a mean ±SD of 1.894±0.796, while patients with moderate-severe hirsutism (n=14): mean of serum total testosterone was 2.88±1.994, 10 patients (71.4%) had elevated testosterone with a mean ±SD of 3.79±1.587. Mean testosterone level in patients with severe hirsutism was significantly higher than that of patients with mild hirsutism (P-value 0.0003); while there was no significant relationship between mean serum prolactin levels of the two groups (P-value 0.170). (Table 8)

**Table 8** Mean serum testosterone and prolactin according to severity of hirsutism.

<table>
<thead>
<tr>
<th></th>
<th>Pt. score 8-15 (n=36)</th>
<th>Pt. score &gt;15 (n=14)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean testosterone ng/ml</td>
<td>1.284±1.994</td>
<td>2.88±1.994</td>
<td>0.0003 (significant)</td>
</tr>
<tr>
<td>Mean prolactin ng/ml</td>
<td>16.63±7.434</td>
<td>20.94±14.402</td>
<td>0.170</td>
</tr>
</tbody>
</table>
Some other cutaneous manifestations of hyperandrogenism were found during examination of the patients, their frequencies and percentages are found in (Figure 4).

![Figure 4](image-url)

**Figure 4** Frequencies of other skin manifestations in patients with hirsutism.

**Discussion**

Perception of hirsutism is by definition subjective, and women present with a wide variation in severity. Both the severity of hirsutism and the degree of its acceptance are dependent on racial, cultural and social factors [7]. Most women who seek treatment for hirsutism do so for cosmetic reasons because excess body hair outside of cultural norms can be very distressing [10].

All 50 patients who involved in this study showed great degree of distress, because hirsutism interferes with their social, marital life, as well as it significantly affects women perception of her femininity.

Mean age of patients was 27.64±7.266 with age of onset was ranged 12-32 years; these results were comparable with other studies [16, 17].

All patients had slow progression of hirsutism over years (mean duration was 7.52±6.217) and none of them gave a history of rapidly progressive disease or severe virilization.

Family history was found in 80% of cases, which is a significant result as family history was positive in a rate of 14-50% in most studies [7, 10, 17, 18]. In two previous Iraqi studies, family history was present in 48-49% of patients [4, 19]. Many of our patients had more than one family member who complains from hirsutism (58%), especially sisters and aunts. This tendency to familial clustering might be anticipated since some of the underlying disorders that result in hyperandrogenism have familial basis ex: PCOS and congenital adrenal hyperplasia, also genetic studies conducted to date suggest a polygenic etiology for hyperandrogenic disorders, but the results are inconsistent [2, 7].

Rate of infertility and irregular menstrual cycles among patients group were 12% and 44% respectively. These features might go with the underlying hyper-androgenemia and other endocrine disorders like PCOS in those
patients and it matches other studies and literature [7, 16, 18, 20].

Mean body weight and BMI among hirsute patients were elevated (68.4±7.266) and (27.84±6.579) respectively, it still not statistically different from that of control group. Number of obese and over weight patients was 30 (60%). This is comparable with other Iraqi study [20]. Obesity is a common clinical sign in hirsute women since it reported in 50-80% of patients with PCOS which represents a major etiological factor for hirsutism [1, 8, 19, 20].

16 patients (32%) had android obesity (WHR≥0.85). Mean weight and BMI are elevated over that of patients with non-android overall obesity whose number was 14 (28%); this is comparable with results of a study about the relationship of mean wt., BMI and WHR with hirsutism in Iran [8]. Hirsutism and menstrual abnormalities are frequently seen in women with android obesity. These conditions are probably due to the peculiar endocrine profile with a preponderance of androgen activity, elevated free testosterone, and low sex-hormone binding globulin concentrations in plasma [8, 21].

31 patients (62%) had elevated serum total testosterone, mean level in those patients was 2.5±1.41, while mean level of serum total testosterone of control group was 0.4±0.443; it was elevated in 4% only. There was highly significant statistical difference between the two groups (p-value 0.0001). This result disagrees with other studies that show less percent of hirsute patients with androgen excess, although still elevated androgen level is more in patients group than control [16, 17, 19].

We expect that androgen excess could be found in even more than 62% of patients because we measure only serum total testosterone which is less sensitive than serum free testosterone in establishing hyperandrogenemia [1, 7, 22]. 50% of patients with mild hirsutism (score 8-15) have elevated androgen level [1] and consequently much more if patients have severe hirsutism [1, 11]. We agree with literature and other similar studies [18].

20% of patients had elevated serum prolactin, mean level in those patients was 32.11±9.839, while 4 patients (8%) of control group had elevated serum prolactin; there was no significant statistical difference between the two groups (p-value 0.074). This match well some studies [16, 18]. The exact relationship between hirsutism and prolactin is not clear. The incidence of hirsutism in the amenorrhea-galactorrhea syndrome has been reported as 22-60%. Women with hyperprolactinemia may have an increase in functional androgens through adrenal overproduction and through a decrease in sex hormone-binding globulin caused by a diminution of ovarian estrogen production.

There was no significant correlation between serum total testosterone and serum prolactin levels and BMI or WHR (P-value>0.05). This result disagrees with some studies [8]. We found that BMI and WHR are more related to score of hirsutism rather than serum androgen level.

Regarding the severity of hirsutism; 36 patients (72%) had mild hirsutism (score 8-15) and 14 patients (28%) had moderate to severe hirsutism (score >15). This matches well with some studies [17] and not with others [19].

Significant correlation was found between the score of the patients with BMI and WHR (P-value <0.05). This result is comparable with other studies [8]. Obesity with lowering sex binding globulin can results in a higher
level of free testosterone which can cause hirsutism [22].

Also there was highly significant statistical relationship between the score of the patients and serum androgen level; patients with scores>15 had significantly higher levels of serum androgen than those with lower scores. This result does not match well with some studies [16], but it is comparable with others [2, 15, 17]. A clinician may suspect gross abnormalities of androgen level associated with some endocrine disorder in patients with marked hirsutism [17].

Seborrhea, androgenetic alopecia, acne and acanthosis nigricans were recorded in patients with decreasing frequencies. They represent other features of hyperandrogenism [1, 2, 7, 11], while hypertrichosis is found in 72% of patients especially in those with high score hirsutism. Whether this is related to their high androgen level or due to the hypersensitivity of hair follicles to androgen is still unknown for us and may need further investigations.

**Recommendations**

Hirsutism is frequently seen medical problem in our practice that may need attention from dermatologists, endocrinologists and even gynecologists (as many cases represent PCOS).

Hirsutism can give a clue to underlying endocrine disorder especially if patient have high score of hirsutism, thus it should not be ignored as it simply represents a cosmetic, racial or familial problem.

**References**


